

REMARKS

Applicant respectfully requests reconsideration. Claims 1-6, 12-32 and 39-44 were pending in the application, with claims 6, 23-28, 31 and 32 being withdrawn in consideration. Claims 2-6, 17, 18, 23-29, 31, 32 and 44 have been cancelled. Claims 1, 13-16 and 39 have been amended. Claims 45-47 have been added. No new matter has been added. Claims 1, 12-16, 19-22, 30, 39-44, 46 and 47 are now pending for examination, with claims 1 and 30 being independent.

Rejection of Claims under 35 U.S.C. §112

Claims 17, 18 and 44 were rejected under 35 U.S.C. §112 first paragraph as failing to comply with the written description requirement.

Without acceding to the correctness of this rejection, Applicant has cancelled these claims without prejudice. Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claims 1-3, 5, 19-21 and 39-41 in view of Ito

Claims 1-3, 5, 19-21 and 39-41 were rejected under 35 U.S.C. §102(b) as being anticipated by WO98/44569 (Ito).¹

Claim 1 has been amended to include the limitation of dependent claim 4 which does not stand rejected on this ground, amongst other limitations. Ito fails to teach or suggest a semiconductor structure comprising a silicon substrate and a silicon germanium layer formed on the silicon substrate, as recited in independent claim 1. Ito also fails to teach or suggest a semiconductor structure comprising an intrinsic gallium nitride material layer and an aluminum gallium nitride layer formed on the gallium nitride material layer, as recited in claim 1. Because Ito fails to teach or suggest each claim limitation, independent claim 1 is novel in view of Ito.

Moreover, Ito teaches away from a semiconductor structure that comprises a gallium nitride material region and a silicon substrate (and a silicon germanium layer) as claimed. Ito provides a list of a number of possible substrates, which includes silicon, and a list of a number of possible

¹ Applicant is responding to this rejection under the assumption that U.S. Patent No. 6,583,442 is corresponding in English version of WO98/44569 as suggested in the office action.

semiconductor materials which includes gallium nitride materials. However, it is clear that not all of the possible substrates may be combined with all of the possible semiconductor materials. Specifically, Ito states that the substrate “needs to be *transparent* to light emitted from the light emitter to be obtained.” (Emphasis added). (See Ito, Col. 3, lines 40-45). As known to those of ordinary skill in the art, gallium nitride materials emit light having wavelengths in the green-blue to UV region of the spectrum. Those of ordinary skill in the art also know that a silicon substrate is *not transparent* to light having such wavelengths, but rather strongly absorbs such light. Furthermore, as pointed out in the amendment filed May 10, 2004, silicon germanium also absorbs such light. Therefore, Ito teaches away from a structure including a silicon substrate and a gallium nitride material layer, and even more so, a structure that further includes a silicon germanium layer as claimed.

Applicant acknowledges the response to earlier arguments (filed May 10, 2004) in the office action regarding SiGe substrates, but further notes that silicon also is not transparent to light emitted by gallium nitride materials.

Because Ito teaches away from the structure of claim 1, one of ordinary skill in the art would not have been motivated to modify Ito to achieve the structure of claim 1. Therefore, claim 1 is also not obvious in view of Ito.

The remaining pending claims that stand rejected on this ground depend from claim 1 and, thus, are novel and non-obvious in view of Ito for at least these reasons.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claims 1-3, 5, 15, 19-21 and 39-41 in view of Hata

Claims 1-3, 5, 15, 19-21 and 39-41 were rejected under 35 U.S.C. §102(b) as being anticipated by WO98/42030 (Hata).²

Claim 1 has been amended to include the limitation of dependent claim 4 which does not stand rejected on this ground, amongst other limitations. Hata fails to teach or suggest a

² Applicant is responding to this rejection under the assumption that U.S. Patent No. 6,417,525 is corresponding in English version of WO98/42030 as suggested in the office action.

semiconductor structure comprising a silicon substrate and a silicon germanium layer formed on the silicon substrate, as recited in independent claim 1. Hata also fails to teach or suggest a semiconductor structure comprising an intrinsic gallium nitride material layer and an aluminum gallium nitride layer formed on the gallium nitride material layer, as recited in claim 1. Because Hata fails to teach or suggest each claim limitation, independent claim 1 is novel in view of Hata.

Moreover, Hata also teaches away from a semiconductor structure that comprises a gallium nitride material region and a silicon substrate (and a silicon germanium layer) as claimed. Hata notes that the substrate should be one that is usually used for a light emitter. Though Hata does list of a number of possible substrates, which includes silicon, and also discloses use of gallium nitride materials, Hata fails to specifically teach this combination. As noted above, a silicon substrate and a silicon germanium layer are not transparent to light emitted by gallium nitride materials and, thus, are not typically used in many gallium nitride material-based light-emitting device applications.

Furthermore, Hata teaches away from a structure that includes an intrinsic gallium nitride material layer. In contrast, the structures in Hata include doped gallium nitride layers which form a p-n junction needed for device operation.

Because Hata teaches away from the structure of claim 1, one of ordinary skill in the art would not have been motivated to modify Hata to achieve the structure of claim 1. Therefore, claim 1 is also not obvious in view of Hata.

The remaining pending claims that stand rejected on this ground depend from claim 1 and, thus, are novel and non-obvious in view of Hata for at least these reasons.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claim 15 in view of Ito

Claim 15 was rejected under 35 U.S.C. §103(a) as being unpatentable over Ito.

Claim 15 depends from claim 1 which is patentable over Ito for reasons noted above. Therefore, for at least this reason, claim 15 is also patentable over Ito.

Accordingly, Applicant respectfully requests withdrawal of the rejection on this ground.

Rejection of Claims 4, 13, 14, 30, 43 and 44 in view of Ito and Bulsara

Claims 4, 13, 14, 30, 43 and 44 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ito in view of U.S. Patent No. 6,589,335 (Bulsara). Claim 1 was amended to include the limitation of claim 4. Thus, Applicant is also addressing the patentability of claim 1 with respect to this rejection.

The Office Action appears to take the position that it would have been obvious to modify Ito to include a silicon substrate and a SiGe layer, as taught by Bulsara. However, as described above, Applicant notes that Ito teaches away from such modification. In particular, Ito teaches away from a structure that includes a silicon substrate, a silicon germanium layer and a gallium nitride material region because the silicon substrate and silicon germanium layer absorb light having wavelengths emitted by gallium nitride materials.

Furthermore, even if one combined Ito in view of Bulsara, the combination would not teach or suggest each limitation of claim 1. Such combination would fail to teach or suggest a gallium nitride material region including an intrinsic gallium nitride material layer and an aluminum gallium nitride material layer.

Because one of ordinary skill in the art would not have been motivated to combine Ito and Bulsara, independent claims 1 and 30 are patentable in view of this combination. Claim 1 is also patentable because such combination would not teach or suggest each claim limitation.

The remaining pending claims that stand rejected on this ground depend from one of the independent claims and, thus, are patentable for at least these reasons.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claim 12 in view Ito and Redwing

Claim 12 was rejected under 35 U.S.C. §103(a) as being unpatentable over Ito in view of Redwing. Claim 12 depends from claim 1 which is patentable over Ito for reasons noted above. Redwing fails to provide the deficiencies of Ito in connection with independent claim 1 and, thus, also dependent claim 12.

Accordingly, Applicant respectfully requests withdrawal of the claim rejection on this ground.

Rejection of Claims 16-18, 22 and 29 in view of Ito and Haga

Claims 16-18, 22 and 29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ito in view of U.S. Patent No. 5,403,673 (Haga).

Claim 18 has been cancelled. Claims 16, 22 and 29 depend from claim 1 which is patentable over Ito for reasons noted above. Haga fails to provide the deficiencies of Ito in connection with independent claim 1 and, thus, also dependent claims 16, 22 and 29. Therefore, for at least this reason, these claims are patentable over the combination of Ito in view of Haga.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of Claim 22 in view of Hata

Claim 22 was rejected under 35 U.S.C. §103(a) as being unpatentable over Hata.

Claim 22 depends from claim 1 which is patentable over Hata for reasons noted above. Thus, for at least this reason, claim 22 is also patentable over Hata.

Accordingly, Applicant respectfully requests withdrawal of the claim rejection on this ground.

Rejection of Claims 4, 13, 14, 43 and 44 in view of Hata and Bulsara

Claims 4, 13, 14, 43 and 44 were rejected as being unpatentable over Hata in view of Bulsara.

Claim 1 was amended to include the limitation of claim 4. Thus, Applicant is also addressing the patentability of claim 1 with respect to this rejection.

The Office Action appears to take the position that it would have been obvious to modify Hata to include a silicon substrate and a SiGe layer, as taught by Bulsara. However, as described above, Hata teaches away from such modification. In particular, Hata teaches away from a structure that includes a silicon substrate, a silicon germanium layer and a gallium nitride material region

because the silicon substrate and silicon germanium layer absorb light having wavelengths emitted by gallium nitride materials.

Furthermore, even if one combined Ito in view of Hata, the combination would not teach or suggest each limitation of claim 1. Such combination would fail to teach or suggest a gallium nitride material region including an intrinsic gallium nitride material layer and an aluminum gallium nitride material layer. Furthermore, Hata teaches away from a structure that includes an intrinsic gallium nitride material layer. In contrast, the structures in Hata include doped gallium nitride layers which form a p-n junction needed for device operation.

Because one of ordinary skill in the art would not have been motivated to combine Hata and Bulsara and such combination would fail to teach or suggest each claim limitation, independent claim 1 is patentable in view of this combination. The remaining pending claims that stand rejected on this ground depend from claim 1 and, thus, are patentable for at least these reasons.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of claim 12 in view of Hata and Redwing

Claim 12 was rejected under 35 U.S.C. §103(a) as being unpatentable over Hata in view of Redwing.

Claim 12 depends from claim 1 which is patentable over Hata for reasons noted above. Redwing fails to provide the deficiencies of Hata in connection with independent claim 1 and, thus, also dependent claim 12. Therefore, for at least this reason, these claims are patentable over the combination of Hata in view of Redwing.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Rejection of claims 16-18 and 22 over Hata and Haga

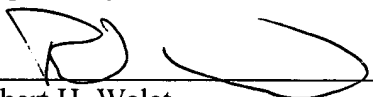
Claims 16-18 and 22 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hata in view of Haga.

Claims 16-18, 22 and 29 depend from claim 1 which is patentable over Hata for reasons noted above. Haga fails to provide the deficiencies of Hata in connection with independent claim 1 and, thus, also dependent claims 16-18, 22 and 29. Therefore, for at least this reason, these claims are patentable over the combination of Hata in view of Haga.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

Dated: April 17, 2006

Respectfully submitted,

By 

Robert H. Walat

Registration No.: 46,324

Randy J. Pritzker

Registration No.: 35,986

WOLF, GREENFIELD & SACKS, P.C.

Federal Reserve Plaza

600 Atlantic Avenue

Boston, Massachusetts 02210-2206

(617) 646-8000